1,1 SPL 1

There is as this moment no word for what this book is about, so the title on the cover must serve.

This book is meant to explain, instruct, predict and inspire.

The author is not an electronics engineer; he is not even a librarian, or a records consultant, or in programmed education. The author is a guesser. In this book I mean to predict some things that are going to be happening in the world. I will explain what they are, why they are important, why they will constitute, taken together, one of the greatest strides forward that mankind has ever made; and (most importantly) why they constitute one thing and will get dangerously out of hand unless treated as such.

We are on the verge of an overwhelming series of changes: changes in the way everything is donex, changes in the attentions and texture of our lives.

These changes will be technological in origin, but social in consequence. They will not, in the usual sense, be "automation." That is why I have coined a new word.

# SPLANDREMICS

An approach to automatic texts, display,

and information handling

The people who know the machines simply will not talk: they will not predict, they will not guess, they will not conjecture about what is coming. They have made a new kind of world ~~m~~ quite likely, and yet they will not say what it is. A few people who know the machines will predict five, even ten years into the future. Beyond that, ~~nom~~ one dares stick his neck out. (But they have an inkling: it is in the air.)

~~Thus~~

Thus it has become necessary for the present writer, a guesser and idea man with a lifelong interest in writing, displ~~y~~, and the arrangement of presentations, to say what others will not
organization
and try to organize what is in the air.

## SUMMARY AND NUTSHELL

I want to start out by announcing what is coming in the most striking terms possible. If that is interesting, the reader will go on to the reasons for my belief, a review of the way things have been going, how things stand today, and what the real problems of the future-- this future-- are going to be.

Let me ask that the reader suspend briefly ~~xtxm~~ whatever he has been expecting and what he has been told. There is a lot of Buck Rogers talk by people talking as if they knew. I am not an expert, but I want to claim ~~x~~ emphatically that nobody is an expert, and the reader must be his own judge, in the light of the facts and arguments I present, of what may happen.

At some time in the near future-- between five and twenty years from now-- every process that we now associate with reading, writing and record-keeping will have changed drastically.

We will read, not from papers, books and magazines, but from glowing screens or projections on the wall. If there are actual pieces of paper from which to read, they can be thrown away as soon as we've read them-- for they can be re-created at will by the same machines that printed them. A writer need no longer handle bothersome notes and manuscripts; when he types his ideas they will go not onto paper, but into a form of storage far handier than paper: probably some form of tape recorder. When he wants to make changes in what he has written, it will be projected on a screen for him, and he can delete and insert with a pencil of light. And when he is through, he needs only to press a button and his entire manuscript will whisk over the phone lines, in minutes, to a publisher. But the publisher will not print it in a book. Rather, he will keep it on <u>his</u> tape recorder, and probably send it over wires to libraries and satellite libraries around the country. Anyone who wants to read it will receive it by wire on his home set.

But what kind of a book will it be? Will it be one continuous sequence of sentences and chapters, albeit appearing as a group of shadows? Probably not. It is more likely that the "book" of the future will be a collection of paragraphs or sections organized according to entirely new princples: not in one continuous

line of words, but rather presenting its material in different order to the people reading it depending on their interests and prior knowledge.

Education will have changed drastically. ~~xxxxx~~ Today (as yesterday) ~~xxx~~ schools are places where pupils meet with an instructor in groups, then go away to do their reading. At this future time an individual will sit at a console and have written materials, texts, ~~xxxx~~ pictures and sounds presented to him~~x xxxxxxxxxxxxxxx~~ in varying and sometimes dramatic form. Depending on his answers to questions and ~~xxx~~ the preferences he indicates, a wide variety of sights and sounds will come before him. This teaching method will be so much better and faster than anything previously known that what we now call a year's schooling will be a matter of weeks. The ~~xxxx~~ quality of education will be vastly improved, its cost greatly reduced, and its amount -- the quantity of education people get -- increased colossally.

Our leisure-time reading will also be very different. Suppose you are interested in~~x~~ studying, say, Japanese ~~xxxxxxx~~ history, but know nothing about it. Everything that has been written about it is available to you-- if not in seconds, in minutes. Pictures and recordings from every epoch are also within the reach of your home machine. You sit down and press appropriate contxrols. Projected on a screen before you ~~xxx~~ is an index. You press a button selecting "History." A new index swiftly appears and you select, "Japan." It will take ~~xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx~~ several seconds ~~xxxxxxx~~ minutes for the large library machine (a hundred miles away) to muster any significant amount of material, so in the meantime your machine reminds you of several things you have asked to be~~x~~ reminded of--

birthdays coming up, your bank balance, the names of several new people in the office, and the exact sequence of current events in the last six months.

[illegible]

These images fade, and a map of Japan [illegible] appears on the screen. Some background music is heard. Five hundred words of introductory text give you a rough idea of how the subject is [illegible] divided for presentation. An index then appears, and you [illegible]elect to take a "Chronological" approach, rather than geographic, sociological, [illegible] anthropological or economic. The text begins again, and with it you see [illegible] photographs, and paintings, you hear music, and sometimes snaps of motion picture appear. From time to time you are asked a question about what you have just seen, and depending on how well you [illegible] have grasped it, you will be presented with the same points rephrased or entirely new material.

So far all this sounds like familiar science-fiction. Presumably such equipment will be invented sometime in the indefinite future, when flights to Mars are commonplace, the problem of overpopulation is conquered, etc.

It may therefore surprise the reader to learn that all the equipment to do these things exists now.

A revolution is in progress.

The reader well may ask why, with this new revolution in progress, why nobody has heard of these things before, and why nobodoy has announced such remarkable inventions.

The answer is twofold: first, many people have heard of these things before, and, within their specialized fields, are mobilizing to cope with them in specialized ways. These different fields will be discussed below, in sections , , and .

But why have no special inventions been announced? Because since 1948 there are now new inventions here; at least, none that represents a shocking new change, like the atomic bomb or the airplane. Rather, there are just improved units of old kinds-- such as the telescope, the oscilloscope, the tape recorder-- which in their new combination make a shocking break with the old.

(since 194 )
No single part/is completely new. The unity, however, is new; the types of use and the kind of planning are new.

Automatic data machines-- commonly miscalled "computers" now almost twenty years old.
-- are/ Their connection with other devices for display, their use in handling texts, and their use to store huge files of information, these are recent.

Here are the crucial features of this new revolution:

1. The automatic storage, transmission and display of texts by electronic and electromechanical devices.

2. The addition of "branching logic"-- alternative pathways-- to audio-visual and textual systems.

3. The reliance on signal linkage-- electrical pulses rather than mechanical connections-- between elements of storage and display systems.

It is my contention that the combination of these elements, as soon as its importance is recognized, is comparable in importance and sweep to the invention of movable type-- or, perhaps, of writing.

For every purpose that we now effect by pencil and paper -- books and tests, memoranda and letters, ideas and explanations and comments and students' notes, systems are possible using today's data equipment that will accomplish them better and faster and more clearly.

For every sort of record-keeping-- including such tabulations as cost and expense accounting, or even the details of census data-- systems are possible,using today's data equipment, that will more accurately, and more clearly, and more precisely, and far more quickly, abstract and present the significant parts that we want to know and understand.

For every kind of display function-- including graphs and charts, sounds and speech, pictures and music-- whatever might today be called "audio-visual" materials-- there are possible, using today's data equipment and accessories, systems that will make it possible for us to see much more, understand much more, and know much more.

There are a lot of words for systems of this type, one word for each specialist working on one type of such system.

But I have searched in vain for a term that covers all these systems. For I am certain that these systems have too much in common to be left to a lot of specialists; I am certain that the details and contents of these systems, though currently in the

hands of such specialists, are not by nature specialized; they ought by rights to be understood by everybody; their problems ought to be out in the open, so that arbitrary decisions made by the system designers will not be shrouded in mumbo-jumbo.

It seems to me that a new monolith has appeared in our midst, a very big and solid object, and people are tiptoing around it, and speaking in esoteric whispers, because it seems so ghostly.

I have coined the word "Splandremics" to signify all of these. Thus "Splandremics"is a united class of systems, some of which exist and the best of which do not, for

Splandremics is the unified field of record-keeping, display and automatic control; it is the union of man, his records, and his automatic devices.

A splandremic system, then is a set of equipment, procedures and units of information that will handle records, present some of them to someone, and depending on what he does, present him new things and operate other equipment. Thus Splandremics is a united class of systems, some of which exist and the best of which do not.

Automatic data equipment is extremely varied, and it lies at the heart of these matters. Most conspicuous in recent developments has been the "computer"-- a generalized, multi-purpose switching machine. Around this generalized machine have developed a host of peripheral gadgets, all of which existed in some form before the computer. Let me discuss some of these different devices. In particular I want to discuss the "computer" in a way that will dispel some of its apparent magic and make clear the reasons for its importance and versatility. Misunderstanding, buncombe and pure hogwash surround the "computer" in the mind of Americans today. Because the "computer" is "turning us all into numbers," many humanistic intellectuals are demonstrating increasing terror as the "computer" grows in importance; and what is worse, it seems likely that out of misguided fear, disgust and apathy the general intellectual is going to wholly desert those matters he should be considering about the actual functions and future use of these machines.

The very name "computer" is an unfortunate misnomer. Many other terms would be much more appropriate: "general switching machine" (GISM), "automatic data processing unit" (APDU), "stored-program rapid automatic device" (SPRAD) would be some more neutral terms. But, indeed, historcally the first task of the computer was computation; and its tasks will always involve intricate, repetitious comparisons and calculations.

The digital computer in its present form was invented in the 1940's. Compared to today's earnest researches its discovery would seem almost accidental.

The first automatic digital computer was put together by an engineer and a graduate student. However, as soon as it was realized what was going on, such minds as Turing and von Neumann turned to examine its nature and its possibilities.

This first machine, ENIAC, was on completion put to use calculating ballistics.

Its advantage over a desk calculator was that it could perform a long series of operations without constant supervision and control by a human operator.

This machine performed several hundred additions per minute. (The "addition" is by now means the only thing a computer can do. However, because all the different operations generally take different lengths of time, one states the number of additions a given machine can perform in a second as a rough measure of its speed.)

Since then-- and it is extremely important to note this-- the machines have been getting better, cheaper and faster roughly by factors of ten. That is, a "new and better" computer is not usually twice as fast, or three times as fast, but often ten or more times as fast, or cheap, or powerful. Several leaps like this make up a "generation."

We are now on the fourth or fifth generation of computers-- a progress, in twenty years, comparable to aviation and rocketry in the last sixty, or medicine in the last two thousand. Where the early computers could perform a hundred additions a minute (Perhaps,) today's machines can perform half a million additions per second-- with several more leaps possible before the theoretical limits are reached. At the same time, the cost per computation has been going swiftly downward, being roughly cut in half each year.

Moreover, the number and variety of accessories which have been adapted to the computer is profuse and impressive.
Originally information went in and came out as punched cards. Then they added printing machines. Then they added console typewriters. Now computers can write on the screen of a cathode ray tube (the main tube of a TV set,)

Of course they can turn anything on and off if it has a switch. And it can receive information from anything that can be rigged to affect an electrical field-- and that includes anything at all.

At this point let me attempt to explain what a computer really does, and why the name gives such a false impression.

A computer is a device which operates on information. It is not merely a control device like the thermostat (which makes a simple electrical response to a simple phenomenon, the change of temperature,) but differs radically from the thermostat in the complexity and quantity of information on which it can operate, and the complexity of its own response-- the operations it performs internally.

These operations are not a fixed list, but somewhat arbitrary. Conventionally they consist of not only arithmetic operations, but comparison operations-- "compare this number or letter with that one"-- and branching operations-- "If these numbers (or letters) are different, then begin performing such-and-such a list of operations."

In addition to these internal operations, the machine has what are called input and output operations.
Without input operations it would be impossible to give instructions to the machine, let alone the news on which you want it to act, and without output operations it could not tell you its answers. Since turning things on and off constitute one kind of "answer," the machine would hardly be useful without this kind of instruction.

The internal operations of a computer are roughly like counting on your fingers-- in fact, they are exactly like counting on your fingers. But you must consider that a big machine has three or four sets of giners on which it counts, as well as over 32,000 sets of fingers in which it can set aside the results of its counting. (Or consider them to be like strips of wet clay onto which the image of the straight fingers can be pressed.)

Consider that if you had no pencil and paper, but only these

fingers to count on, you would probably invent many different and versatile forms of counting-- left to right, right to left and carry-- to do all the things you now do with paper or in your head: multiplying, dividing, etc.

Moreover, consider that you had no mouth to speak with, but could touch your fingers to another person's and transfer to his hands the words and ideas you held there for him. Then you would also develop codes that would permit the transmission of words and ideas by this method.

This is what the computer people have done. A great deal of attention has gone into tricks of finger-computation and codes by which a machine can efficiently communicate. Of course, there are no fingers in the machine, but rather the electrical equivalent: they may be thought of as patterns of sparks in the bowels of the machine which may be changed in fixed ways, which may themselves cause changes, and which may be printed or delivered to the world outside at specified times.

It may be asked, how can the computer be instructed to do so many different things? Does not the structure of the machine impose a certain fixed series of things-to-be-done upon whatever information is fed into it?

Definitely not; and this is one of the great strides that was made in the early days of the computer. The program (with its further elaborations, the program branch, the program loop, and the program metalanguage,) create the extraordinary abilities of these machines.

A computer program is a list of instructions. Remember that the computer has wired into it certain basic instructions. None of these is carried out by the machine unless it appears on the list of instructions for a particular problem or task. This list of instructions is called a program. While it may be written as a list of code words, in fact the program is a set of exact instructions to the machine something like the following. (I am substituting the terms "left hand" and "right hand" for the real names of equivalent places in the machine.

~~With your left hand~~
~~Take a number from location one~~

(this will permit the reader to act out the program, if he wants.)

EMPTY YOUR LEFT HAND
PUT THE NUMBER "ZERO" IN YOUR RIGHT HAND
WITH YOUR LEFT HAND,
TAKE A NUMBER FROM SPACE NUMBER 1
ADD IT TO THE NUMBER IN YOUR RIGHT HAND

So far, of course, all we have done is taken a number from space number 1, wherever that may be, and put it in our right hand. Now continue:

WITH YOUR LEFT HAND, TAKE A NUMBER FROM SPACE NUMBER 2

ADD IT TO THE NUMBER IN YOUR RIGHT HAND

Now, after all this trouble, you have added two numbers. But of course, it is still a secret without an output instruction. So take the output instruction

HOLD UP THE RESULT FOR EVERYBODY TO SEE

and the program is completed. You have added two and two.

Of course, it is a little more general than that. The program did not say to add two and two, but rather, to add the numbers in two places called "space one" and "space two:" we have assumed that each one of them contains the number 2. But it should be obvious that the program would have added <u>any</u> two numbers, if only our hands could count above five.

All right, let's assume that. Let's assume that we have a much bigger hand; one that can count up to a hundred. (Or, as long as we're being hypothetical, make it a hundred million.) Suppose we write a program that will add up lots of numbers. Now again, take the first part of the progr

Of course it has to begin the same way:

1. EMPTY YOUR LEFT HAND
2. PUT THE NUMBER "ZERO" IN YOUR RIGHT HAND

Now we get to the adding part:

3. WITH YOUR LEFT HAND, TAKE A NUMBER FROM SPACE NUMBER 1
4. ADD IT TO THE NUMBER IN YOUR RIGHT HAND
5. WITH YOUR LEFT HAND, TAKE A NUMBER FROM SPACE NUMBER 2
6. ADD IT TO THE NUMBER IN YOUR RIGHT HAND
7. WITH YOUR LEFT HAND, TAKE A NUMBER FROM SPACE NUMBER 3
8. ADD IT TO THE NUMBER IN YOUR RIGHT HAND
9. WITH YOUR LEFT HAND, TAKE A NUMBER FROM SPACE NUMBER 4
10. ADD IT TO THE NUMBER IN YOUR RIGHT HAND

repetitious,
It certainly is isn't it. Does that mean that to add ten numbers, you have to repeat that instruction ten times in the program?

Perhaps it will have occurred to the reader that there is a delightfully simple way to save space in the program. Let us begin again:

1. EMPTY YOUR LEFT HAND
2. PUT THE NUMBER "ZERO" IN YOUR RIGHT HAND

3. WITH YOUR LEFT HAND, TAKE A NUMBER FROM SPACE 1
4. ADD IT TO THE NUMBER IN YOUR RIGHT HAND

Now comes the change:

5. ADD 1 TO THE END OF INSTRUCTION 3
6. GO BACK TO INSTRUCTION 3

If we add 1 to the end of Instruction 3, it changes Instruction 3 to:

WITH YOUR LEFT HAND, TAKE A NUMBER FROM SPACE 2

which we had to write as a separate instruction before.

The reader may grasp that with these new instructions, we have accomplished the same thing we did with a long list of instructions before. Adding 1 to instruction 3 changes "SPACE 1" to "SPACE 2", so the number from space 2 is added; and then when you go back to Instruction 3 you take the number from space 2. Then, in due course, you add it to you go on to instruction 4 and put it in your right hand.
Then what?

Obviously, you reach Instruction 5 again, and change Instruction 3 again on that account; then instruction 6 sends you back to do instruction 3 again, and so on forever.
loop.

This is called a program loop. And you might make it more graphic by drawing this picture of it adding an arrow to it: (I am simplifying the wording)

Take Number 1

Add it in right hand

Add to number taken

```
1    EMPTY LEFT
2    PUT ZERO IN RIGHT
3    LOAD LEFT FROM 1
4    ADD LEFT TO RIGHT
5    ADD 1 TO INSTRUCTION # 3
6    GO BACK TO 3
```

because it loops around to repeat itself.
This short list of instructions is called a program "loop,"/
As you can see, this short list of instructions will perform the addition operation an indefinitely large number of times.
A fair machine today would be unlikely to make a mistake in millions of repetitions.

It should be obvious how versatile such a program would be for boring, repetitious calculations. For example, suppose you had thirty thousand numbers stored in space 1 to space 30000. These six instructions will add them all up without further prompting. Of course, notice that in the program loop itself there are only four instructions.
To add all thirty thousand numbers the loop is repeated thirty thousand times; since there are four instructions in this loop, the machine actually performs 120,000 instructions.

Now this seems pretty dreadful; but suppose these were real machine instructions (they are quite close to it.) Suppose we put them in a real machine. If each of these instructions in the loop, three through six, takes 1/1000 of a second, then the whole works will take 120 seconds, or two minutes.

Of course the reader will have noticed that the program as it stands would not be very useful, There is no reason to suppose the machine will sense instinctively where to stop, nor will it be at all disposed to show you what it has done, since we have neglected the output instruction.

However, where shall we put it? If we merely tack it on the end, making it instruction #7, the machine will never get to it. If we shove it in the middle, say after #5, the

We could

However, where shall we put it? ~~If we~~ merely tack it on the end

```
1    EMPTY LEFT
2    PUT ZERO IN RIGHT
3    LOAD LEFT FROM 1
4    ADD LEFT TO RIGHT
5    ADD 1 TO INSTRUCTION 3
6    GO BACK TO 3
7    PRINT THE ANSWER AND STOP.
```

However, it should be evident that in this case the machine will never get to the output instruction. It will merely loop forever.

In that case, we might try shoving the output instruction into the middle:

```
1.  EMPTY LEFT
2.  PUT ZERO IN RIGHT
3.  LOAD LEFT FROM 1
4.  ADD LEFT TO RIGHT
5.  ADD 1 TO INSTRUCTION 3
6.  PRINT THE ANSWER AND STOP
7.  GO BACK TO 3
```

In this case, though, it will obviously never complete a loop. Clearly something else, some other kind of instruction, is needed.

This is the program branch. By "branch" is meant a fork, a division of the ways, where the machine could do different things, depending on the circumstances. The only way the machine can judge the circumstances is by an instruction called a test.
The most familiar machines perform tests; for instance, a Coke machine performs various tests on the money it is given. Here is a program to make our computer act like a Coke machine:

```
1.  REST AND WAIT
2.  TEST: HAS                    IF YES, GO TO 3
      COIN BEEN DEPOSITED?       IF NO, GO BACK TO 1
3.  TEST: IS IT A NICKEL?  IF YES, GO TO 12
4.  TEST: IS IT A DIME?  IF YES, GO TO 10
5.  TEST: IS IT A QUARTER?  IF YES, GO TO 8
6.  RETURN COIN
7.  GO BACK TO 1
8   TEST:                HAVE I THREE NICKELS TO RETURN?
      IF NO GO TO 6
9.  RETURN THREE NICKELS
10. DELIVER COKE
11. RETURN TO 1
12. HAS                  SECOND NICKEL ARRIVED? IF YES GO TO 10
13. RETURN TO 12
```

As you see, programs can be equipped to cope with every contingency. Or almost every contingency. One disagreeable feature of the Coke machine program, above, is that by putting in only one nickel you can completely disable the machine, since it will constantly cycle between instructions 12 and 13.

Now let us try putting a test into the first program, to get us out of the addition loop.

1. EMPTY LEFT
2. PUT ZERO IN RIGHT
3. LOAD LEFT FROM 1
4. ADD LEFT TO RIGHT
5. TEST: DOES NUMBER IN INSTRUCTION 3 EQUAL 30000?
   IF YES, GO TO 8
6. ADD 1 to INSTRUCTION 3
7. GO BACK TO 3
8. PRINT THE ANSWER AND STOP.

INSERT → 'BABBAGE'

The reader will see that the versatility of these machines is literally fabulous. By providing appropriate branches to the program, with instructions for special contingencies, the machine can perform interminable series of operations with infinite variations.

The reader may ask, interminable? How can it go on indefinitely without coming to the end of a task? What good would that be?

The answer is that there is a class of operations called on-line (or sometimes real-time) in which you never turn the computer off, but hand it tasks as they come up and expect an answer back in time for it to be of use to you. For instance, in air traffic handling you may want the machine to calculate the relative speeds and positions of all aircraft in the vicinity, make sure none of them are on collision course (or near it,) and decide according to your rules which ones are to come in first. (Your rules might for instance specify that any plane short on fuel should land first, and that the order in which planes come in should be partly based on the amount of fuel they have left and partly based on how long they have been waiting already.)

This is a real-time application called because the machine is being used to control processes taking place in real time. An answer that is too late is nom answer at all. Thus the task has to be one that the machine can accomplish in the time allowed.

The term "on-line" refers to an operation that is similar but less strenuous. For instance, a secretary may want to look up the credit rating of a customer, stored in the machine. There will be no real harm done if the lookup takes a minute rather than a second.

On-line,
~~Off-line~~ then, means that you can make specific requests of the machine and get it to act right away. ~~Off-line, by contrast~~ Anything which goes into an "In" basket, however, and then gets fed into the computer, and whose results then go in the "out" basket, is not on-line. Something is on-line if it is directly linked to the operations of the computer, and not subject to any delay (other than mechanical or due to the program.)

Suppose someone offered you a machine that could bring you every book that had ever been written. As you sit at this machine, the words of the book appear glowing on a screen before you. There are no pages to turn; as you come to the end of a paragraph you touch a button, the first words disappear, and a new paragraph forms itself, instantly. If you grow tired of reading you can skim ahead to new paragraphs, or new chapters; you can summon up the table of contents at any time, or even summaries other people have written. If a particular point makes you curious-- if you do not understand a point, or believe an alleged fact-- you may press buttons that bring up further explanations and evidence. Moreover, as you proceed, the machine makes a record of what you read. If you wish to take notes on what you read, with your own summaries, underlinings, key words and so on, you may do so on a small typewriter. The words you type also appear on a screen, not on paper; if you make a typing error, you can correct it with the touch of a button, and on your command your own notes disappear. They are not really gone, however; they have been put away for you in the bowels of the machine.

This machine can hold as many words or numbers as may be stored on several bookshelves full of books. You need not <u>own</u> books any more, however, since any "books" you could want to read may more conveniently or cheaply be stored in a "library." But those libraries will be great telephone exchanges, and your book will come to you, not in a package or an envelope, but over the phone, to your machine, in a string of incomprehensible chirps.

This delivery is completed in minutes, and you are ready to read any time you like.

Not only books, of course, but every other manner of written thing comes this way. To write a letter, one types into the machine, making such corrections as are necessary, and the machine looks up your friend's address, types it, types the letter, presents it to you for signature and mailing, and stores the carbon copy.

Many letters, though, don't have to be written clear through. You can send the <u>same</u> letter- assuming it's news about your family, say, or a request for product information-- to any number of people, merely by telling the machine whom it is to go to: the machine will look up their addresses, type the date, and type each letter. Or you can have hundreds of steck paragraphs to assemble into letters, merely by number.

Of course, if the person you are writing to has a similar machine, you never even have to <u>mail</u> the letter. You just send it by telephone.

Imagine further that such a machine cost no more than a car. Or even as little as a good TV set.

The reader may feel, as I do, that such a wonderful machine would surely be worth its weight in gold: that although it presents possible drawbacks, and possible unnerving features and dangerous potentialities, that if such machines existed we would want very much to have them and to use them, and we would try to fight the drawbacks.

Then it may interest the reader to know that such machines exist. Thousands of them. At the moment they cost more than cars.

This book is about the general problems and wonderful possibil-

ities of such machines, their design and their use.

THE PAST, PRESENT AND FUTURE OF AUDIO-VISUAL

A field with many devotees today in education/is a group of techniques called "Audio-Visual Methods." In the larger sense of course, audio-visual methods have always been with us; and in the still larger sense which I am about to elucidate, they will take on an entire new scope, sense and meaning and universality.

The audio-visual "movement," of course, is quite limited in its outlook and intent. So I mean to go back further, in order to look at these matters from a still more general point of view. Sights and sounds have been always with us; indeed, speech and pictures have been with us since we became human. And from that time speech and pictures have gone together to make things clear. Even drama and ritual may be considered "audio-visual", in a certain special sense.

But it remained for invention to make possible the union of sight and sound on any other basis than the difficult and inefficient drawing of pictures to accompany human speech. The invention of photography in the nineteenth century, and the concommitant improvement of the lantern slide made possible a vastly improved presentation to audiences of graphic material. A kindred leap forward, Edison's talking machine, which permitted the preparation in advance of displays of sound as well.

A much more dramatic and revolutionary development, however, was the talkind film, in which sound and picture-- even though they had to be prepared at the same instant, in the early Vitaphone process-- could be prepared in complex

detail beforehand.

This development represents an important and distinguishable departure from anything before. It establishes an automatic linkage between the picture and the sound.

The numerous developments since that time have been--except for the very recent ones-- well known. They consist of three major trends: the improvement of the technology of photography and of its presentation; the improvement in the arts and techniques of audio, as well as considerably increasesd flexibiliyy in its use from practice; and a vastly improved technique in the running audio-visual presentation--by which I mean both films and television. Let us examine each of these in turn.

Photography began a t the outset with huge, unwieldy ca cameras and "film" of heavy, fragile glass plates which had to be developed on the spot. The first "prints" were tintypes, and had to be held at certain angles with respect to the light to be properly viewed. Since that day, of course, the main trend has been toward smaller cameras, better films, lower cost and more simplicity. The historical highlighys were the first "Kodak" camerak in 19-- (which had to be sent back to the factoty for relaadimg) the roll-film cameras which became popular in the 1920's, and fonally the miniature cameras. The most significant date for miniatire cameras was 1922 (?) when a renowned German optical firm introduced the Leica--a camera designed to use motion picture film, 35 mm wide. This 35mm camera revolutionized the techniques of photogtaphy by its smallness and the low cost of its film.

It brought with it the disseminati n of photographic skills among the public. It made easier the development of an entire school of photography, "photo-jpurnalism" much of whose development took place under the auspices of LIFE Magazine. &c In a parallel development 35mm film and the mass production techniqued associated with the motion picture film brought about the development of the Filmstrip, a sequence of photographs prepared for serial viewing or projection.

Techniques of projected pictured began, of course, with the development of the lens in the 17th (?) century, but until the development of photography there could obviously be no way of making copies of things to be projected-- except throug printing, of cutouts or similarly unsuitable methods. Moreover, without practioable lamps of cooling fans, boyh requiring that electricity be tamed, projection could never be made useful.

Photography and the light bulb, then, brought the Magic Lantern. And so it was possiboe for photographic displays, for example illustrated lestures on the Holy Land to be seen by wide audiences,

As photaography progressed, and became a household matter, projictors became household appliances. The most dramatic advance eccurred after the introduction of Kodachreme in the 1930's, when the projector became a necessary complement to the camera. With the introductioh of the magazine-load projector in the early 1950's, and the remote-control slide chahger shortly thereafter, the ease of presenting lon g sequences of illustrative materials without fuss ahd at low cest reached a new extreme.

This last represented an important step. If you can change a slide with an electrical pulse, it is not necessary that someone press a button for the electrical pulse to occur. Other events can trigger it. Thus of course it is no surprise that systems were designed which would arrange for triggering impulses from other sources: particularly sound sources. Systems are now commonly available for linking slide projectors and tape recorders. This is done either by prerecording particular signals on the tape which then cause the slide to change; or by gluing silvered markers on the tape; or by even making pencil marks on the tape, in one system. In all cases the effect is the same. The two devices have been linked together not mechanically, but by signals-- and what can be done by signals can be done with more flexibility and ease.

It is to Thomas Edison that we owe the technology of sound recording; although as with so many other inventions mentioned here, it would surely have been invented eventually out of its own "internal necessity." However, as it happened to come about in its original form, it was done by varying the depth of a groove in a rotating drum made out of shellac. In later application this gave way to the less elegant but more convenient rotating disk. Later, in conjunction with films, a recording system using a transparent stripe of varying width became practical.

During the war, a wholly different recordig technique was invented, which imparted magnetic images to a passing wire or tape coated with a suitable magnetic compound.

These a e the basic forms: the cylinder, the disk and the ribbon; ~~xxxxxxxxx~~ the groove, the path of varying light, the

magnetic surface. However, they have now been recombined in so many different systems as to be not worth detailing. For only a few examples, the cylinder (now flexible and called a "belt") has recordings made on it with grooves in the dictaphone and magnetically on IBM's dictation machine.

The technique of films expanded its flexibilities rapidly since its invention also by Edison in 18--. Under D.W. Griffith, it expanded from merely the static depiction of events by an unchanging, an moving camera to a varied pace and varied camera angle and motion. When sound was added to the motion picture, this history of expanded flexibiliyy was repeated. At first the sound and picture had to be made at the same time. Then it was discovered that if the optical sound was recorded in a separate camera, unwanted sounds could be removed, and others inserted, improved, and augmented-- as in adding echoes to the sound in rerecording. By the time of Orson Welles' film "Citizen Kane" in 1940 (?), it was relatively easy for Welles to produce such effects as the sound of a woman's scream becoming the sound of an automobile horn of the same loudness and pitch. as one scene gives way to another. Gradually the editing of sound became a fully mature and integrated part of the picture. (A stunning example of this mature phase was the 1952 (?) picture, "King Solomon's Mines." An important technological onnovation in the 1950's from our point of view was the transition from the use of sound recorded optically to sound recorded magnetically. However, this could not be accomplished merely by running cables of connecting rods from the camera to the recording machine. Since the attempt was to use tape without sprocket holes, (insert in above sentence)

This was accomplished by the Rangertone system, whereby a signal generated on the camera is recorded on the tape along with the sound. When this sound is later transferred to optical recording, the Rangertone signal assures that its length on the final strip of film will correspond in every timing respect with the action in the picture.

I wish to emphasize that this, too is a signal linkage -- which anticipates so many versatile possibilities.

(Two other things I want to mention in regard to films, but I'm not sure how, are sequences of explained stills, as in the "Titan" and the documentary newsreel film. As a matter of fact gotta also mention instructional films.)

((Put the TYPES OF MOVIES into some section on developments and traditions?))

SPL Carbon

No DATE. Typewriter inscription ~~Summer~~ March 1963 / Vol. 16